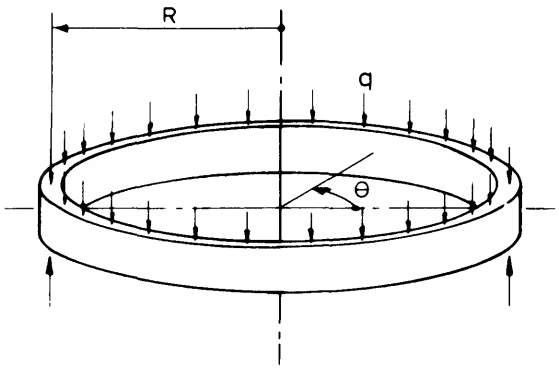
Table 30.3 Design Equations for Rings Loaded Out-of-Plane



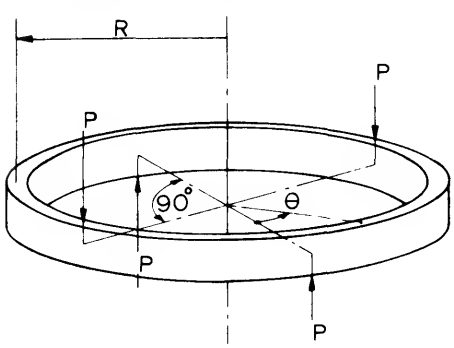
$$M = qR^2\left(\frac{\pi \sin\theta}{2} - 1\right)$$

$$T = qR^2\left(\frac{\pi \cos\theta}{2} + \theta - \frac{\pi}{2}\right)$$

$$Y = \frac{qR^4}{8EI}\{2\pi(\theta\cos\theta - \sin\theta) + \pi^2(1 - \cos\theta) + \lambda[2\pi(\theta\cos\theta - 3\sin\theta) + \pi^2(1 - \cos\theta) + 4\theta(\pi - \theta)]\}$$

$$\psi = \frac{qR^3}{8EI}\{\pi(\pi - 2\theta)\sin\theta + \lambda[\pi(\pi - 2\theta)\sin\theta + 4(\pi - 2\theta - \pi\cos\theta)]\}$$

$$\eta = \frac{\pi qR^3}{8EI}(1 + \lambda)\left[2\sin\theta + (\pi - 2\theta)\cos\theta - \frac{8}{\pi}\right]$$



$$M = \frac{PR}{2}(\sin\theta - \cos\theta)$$

$$T = \frac{PR}{2}(\sin\theta + \cos\theta - 1)$$

$$Y = \frac{PR^3}{8EI}\{2(\theta - 1)\sin\theta + (2\theta + 2 - \pi)\cos\theta + \pi - 2 + \lambda[(6 + 2\theta - \pi)\cos\theta - 2(3 - \theta)\sin\theta + \pi + 4\theta - 6]\}$$

$$\psi = \frac{PR^2}{8EI}\{2\theta\cos\theta + (\pi - 2\theta)\sin\theta + \lambda[(\pi - 2\theta - 4)\sin\theta + 2(\theta - 2)\cos\theta + 4]\}$$

$$\eta = \frac{PR^2}{8EI}(1 + \lambda)[2(1 - \theta)\sin\theta + (\pi - 2 - 2\theta)\cos\theta]$$